



General

Guideline Title

Essential hypertension.

Bibliographic Source(s)

University of Michigan Health System. Essential hypertension. Ann Arbor (MI): University of Michigan Health System; 2014 May. 16 p. [18 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: University of Michigan Health System. Essential hypertension. Ann Arbor (MI): University of Michigan Health System; 2009 Feb. 15 p.

Recommendations

Major Recommendations

Note from the University of Michigan Health System (UMHS) and the National Guideline Clearinghouse (NGC): The following guidance was current as of May 2014. Because UMHS occasionally releases minor revisions to its guidance based on new information, users may wish to consult the [original guideline document](#) for the most current version.

Note from NGC: The following key points summarize the content of the guideline. Refer to the original guideline document for additional information.

The strength of recommendation (I-III) and levels of evidence (A-D) are defined at the end of the "Major Recommendations" field.

Diagnosis

- Although a single, carefully taken blood pressure (BP) reading may predict future cardiovascular risk, for clinical purposes this risk is better identified by taking the mean BP level from recordings over several visits.
- Home and ambulatory blood pressure monitoring helps improve BP control, and identifies "white coat" and "masked" hypertension [IIA].
- If home BP monitoring is used, careful calibration of the BP monitor and thorough patient education are essential.
- Individuals with mean BP >135/80 should be screened for diabetes [IB].

Treatment

- For patients without diabetes or end organ damage, target of BP for
 - Age <60 years is <140/90 mm Hg [IA]
 - Age ≥60 years is <150/90 mm Hg [IB]
- For patients with diabetes or end organ damage (e.g., renal insufficiency, retinopathy, congestive heart failure [CHF], coronary artery disease [CAD], pulmonary veno-occlusive disease [PVOD], cerebrovascular disease), appropriate treatment of hypertension provides significant improvements in clinical outcomes [IA]. Recommended BP targets are systolic blood pressure (SBP) of <140 mm Hg ([IB] for CHF and CAD; [ID] for diabetes and other end organ damage), and diastolic BP goal of <90 mm Hg [IB].
- Treatment of SBP over 160 mm Hg is important in reducing cerebrovascular accident (CVA) and CHF risk [IA].
- Lifestyle modifications to lower BP are important adjuncts to drug therapy [IA].
- Begin therapy with a thiazide diuretic, angiotensin converting enzyme (ACE) inhibitor, or long-acting dihydropyridine calcium channel blocker (DHP CCB) for almost all patients. Add second and third agents as needed to achieve effective BP reduction goals [IA].
 - Specific illnesses may guide the initial and subsequent choice of agents, e.g.:
 - ACE inhibitors (angiotensin II receptor blocker [ARB] for those unable to tolerate ACE inhibitors) for patients with renal disease, diabetes with either micro- or macroalbuminuria, or left ventricular (LV) dysfunction
 - β-blockers for those with CAD or CHF
- Over 70% of individuals require two or more drugs to achieve BP goals. A fixed combination therapy may be cost-effective. Once a day medications increase compliance and are preferred.

Definitions:

Levels of Evidence

- Randomized controlled trials
- Controlled trials, no randomization
- Observational studies
- Opinion of expert panel

Strength of Recommendation

- Generally should be performed
- May be reasonable to perform
- Generally should not be performed

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Hypertension

Guideline Category

Diagnosis

Management

Risk Assessment

Treatment

Clinical Specialty

Cardiology

Family Practice

Internal Medicine

Intended Users

Advanced Practice Nurses

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To accurately diagnose hypertension
- To improve blood pressure (BP) control
- To decrease hypertension-related morbidity and mortality
- To encourage patient's self-involvement
- To provide appropriate education and follow-up
- To provide cost-effective care

Target Population

Adults age 18 and older

Interventions and Practices Considered

Diagnosis

1. Blood pressure (BP) measurement (office, home and ambulatory blood pressure monitoring)
2. Careful calibration of the BP monitor and thorough patient education (home monitoring)
3. Diabetes screening (if indicated)

Treatment

1. Consideration of target BP goals
 - Age <60 years is <140/90 mm Hg
 - Age ≥60 years is <150/90 mm Hg
 - Systolic blood pressure (SBP) of <140 mm Hg (for congestive heart failure [CHF] and coronary artery disease [CAD]; for diabetes and other end organ damage) and diastolic BP goal of <90 mm Hg
2. Treatment of SBP over 160 mm Hg to reduce cerebrovascular accident (CVA) and CHF risk
3. Lifestyle modifications
4. Drug therapy (thiazide diuretic, angiotensin converting enzyme [ACE] inhibitor, long-acting dihydropyridine calcium channel blocker [DHP CCB], angiotensin II receptor blocker [ARB], β-blocker)
5. Combination drug therapy (if needed to achieve BP goals)
6. Preference for once a day medications to increase compliance

Major Outcomes Considered

- Reductions in blood pressure
- Cardiovascular and cerebrovascular morbidity and mortality
- Treatment costs
- Side effects of medications

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Preliminary evidence was identified using literature considered relevant in Joint National Committee (JNC) 7 (see annotated references in the original guideline document). That report utilized literature searches of the preceding reports and added a systematic search of literature from January 1997 through April 2003.

In 2007 a search of literature from 2003 to 2007 was performed that was also utilized to develop the 2009 version of this guideline. That search was conducted on MEDLINE prospectively using the major keywords of: *hypertension, human adults, English language, clinical trials, guidelines, and published from 1/1/03 through 5/1/07*. Terms used for specific topic searches within the major key words included: *alpha 1 blocker, angiotensin converting enzyme inhibitors, angiotensin II receptor antagonist, beta blockers (selective and non-selective), calcium channel blockers (dihydropyridine and non-dihydropyridine forms), centrally acting alpha-2 agonist, diuretics (thiazide and non-thiazide, loop, potassium-sparing), vasodilator (direct), avoidance (alcohol, stress, tobacco), blood pressure monitoring (ambulatory, home), dietary (caffeine, calcium, garlic, magnesium, onion, potassium, sodium), exercise, disease-based management (stroke, coronary artery disease, cardiac, heart failure, arterial fibrillation, peripheral vascular disease, diabetes, chronic kidney disease, metabolic syndrome), and resistant hypertension*. Detailed search terms and strategy available upon request.

In 2013 the full literature search was deferred while waiting for the search results of JNC 2013 ("JNC 8"). However, expert member of the team identified three topics for which important new evidence had been published and systematic searches were performed on those topics. The search was conducted on Medline prospectively using the major keywords of: *hypertension, human adults, English language, guidelines, clinical trials, cohort studies, and published from 1/1/03 through 6/1/13*. Terms used for specific topic searches within the major key words included: *combination of ACE (angiotensin converting enzyme) inhibitors and ARB (angiotensin receptor blockers), combination of ARB and DRI (direct renin inhibitors), and patients age ≥ 65 years (older/elderly) and target blood pressure and treatment*.

The search was conducted in components each keyed to a specific causal link in a formal problem structure (available upon request). The search was supplemented with very recent information available to expert members of the panel, including abstracts from recent meetings and results of clinical trials. Negative trials were specifically sought. The search was a single cycle.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence

- Randomized controlled trials
- Controlled trials, no randomization

Observational trials
Opinion of expert panel

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Conclusions were based on prospective randomized clinical trials (RCTs) if available, to the exclusion of other data; if RCTs were not available, observational studies were admitted to consideration. If no such data were available for a given link in the problem formulation, expert opinion was used to estimate effect size.

Rating Scheme for the Strength of the Recommendations

Strength of Recommendation

- I. Generally should be performed
- II. May be reasonable to perform
- III. Generally should not be performed

Cost Analysis

Fixed combination therapy can be more cost-effective and may improve compliance.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Drafts of this guideline were reviewed in clinical conferences and by distribution for comment within departments and divisions of the University of Michigan Medical School to which the content is most relevant: Family Medicine, General Medicine, and Cardiology. The final version was endorsed by the Clinical Practice Committee of the University of Michigan Faculty Group Practice and the Executive Committee for Clinical Affairs of the University of Michigan Hospitals and Health Centers.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for select recommendations (see the "Major Recommendations" field).

Conclusions were based on prospective randomized controlled trials (RCTs) if available, to the exclusion of other data; if RCTs were not available, observational studies were admitted to consideration. If no such data were available for a given link in the problem formulation, expert opinion was used to estimate effect size.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate management of hypertension

Potential Harms

- Thiazide diuretics increase the frequency of sexual dysfunction in men and women and initially may cause interruptions in daily routine for micturition. Thiazides cause a short-term increase in low-density lipoprotein (LDL) cholesterol; however, long-term trials have shown minimal change and outcome studies show no clinical impact. Thiazides slightly increase risk for diabetes. While small changes in LDL and glycemic control are not contraindications, the clinical impact of these metabolic aberrations has yet to be elucidated. Thiazides can increase uric acid and precipitate attacks of gout. Hypokalemia is uncommon at usual (12.5 mg to 25 mg) doses but occurs relatively often at doses of 50 mg or more.
- Angioedema is a rare side effect (0.1% to 0.7%) of angiotensin converting enzyme (ACE) inhibitors, which may be life-threatening and may occur at any point in the treatment. The incidence may be higher in African Americans. Although renal artery stenosis per se is not a contraindication for ACE therapy, renal impairment may occur in patients with bilateral renal artery stenosis or unilateral renal artery stenosis with a single kidney. All in this class induce cough equally, which may be disabling enough with some patients to result in the need to discontinue the drug; cough occurs more often in women.
- Angioedema has been rarely reported with Losartan, but has occurred in patients with prior angioedema on ACE inhibitors. Losartan has a uricosuric effect (i.e., increases excretion of uric acid, lowering concentration in blood) that is unique compared to others in this class. Losartan may be less efficacious compared to others in this group at lowering blood pressure (BP) and should be used twice a day.
- Edema may occur with calcium channel blocking agents and is more pronounced with the dihydropyridine agents. Bradycardia is a side effect of verapamil and diltiazem, but renders them useful agents in the treatment of atrial fibrillation/SVT). Verapamil has more pronounced bradycardia effects and often results in constipation. Verapamil and diltiazem may increase risk for statin myopathy (cytochrome 3A4 inhibition).
- Occasionally fatigue and uncommonly impotence are side effects of β blockers at the recommended low doses. β -1 blockers produce the same dramatic reduction in angiotensin II levels as ACE inhibitors, and the two agents together have an additive effect. Though β blockers may raise triglycerides and lower high-density lipoprotein (HDL) cholesterol, these effects have not been found to be clinically significant in outcome studies.

Contraindications

Contraindications

- Angiotensin converting enzyme (ACE) inhibitors and angiotensin II receptor antagonists (ARBs) are contraindicated in pregnancy.
- ACE inhibitors and ARBs are relatively contraindicated in patients with bilateral or equivalent renal artery stenosis.
- Short-acting dihydropyridine calcium channel blockers (DHP CCBs) are relatively contraindicated for all coronary artery disease.
- Non-DHP CCBs and alpha blockers are relatively contraindicated in congestive heart failure (CHF) -- systolic.
- Diuretics, ACE inhibitors, and ARBs are relatively contraindicated in patients taking lithium.
- DHP CCB alone is relatively contraindicated in patients with chronic renal disease.
- β -blockers, non-DHP CCB, and alpha-2 agonists are relatively contraindicated in patients with bradycardia and heart block.

Qualifying Statements

Qualifying Statements

These guidelines should not be construed as including all proper methods of care or excluding other acceptable methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific clinical procedure or treatment must be made by the physician in light of the circumstances presented by the patient.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Patient Resources

Staff Training/Competency Material

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

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Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1997 (revised 2014 May)

Guideline Developer(s)

University of Michigan Health System - Academic Institution

Source(s) of Funding

University of Michigan Health System

Guideline Committee

Hypertension Guideline Team

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

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Team Member	Relationship	Company
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	Speaker's Bureau	Daiichi Sanko, Merck
	Research support	Novartis
Masahito Jimbo, MD	(none)	

Guideline Status

This is the current release of the guideline.

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Guideline Availability

Electronic copies: Available from the [University of Michigan Health System Web site](#) .

Availability of Companion Documents

Continuing Medical Education (CME) information is available from the [University of Michigan Health System Web site](#) .

Patient Resources

The following are available:

- Smart goals for hypertension. Ann Arbor (MI): University of Michigan Health System; 2014 Apr. 2 p. Electronic copies: Available from the [University of Michigan Health System \(UMHS\) Web site](#) .
- Hypertension (high blood pressure). Ann Arbor (MI): University of Michigan Health System; 2014 Apr. 4 p. Electronic copies: Available from the [UMHS Web site](#) .
- Home blood pressure monitoring. Ann Arbor (MI): University of Michigan Health System; 2014 Apr. 4 p. Electronic copies: Available from the [UMHS Web site](#) .
- Blood pressure record. Ann Arbor (MI): University of Michigan Health System; 2014 Apr. 2 p. Electronic copies: Available from the [UMHS Web site](#) .

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NGC Status

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